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ABSTRACT

Federal and state governments want to decrease payments for medical education, and other payers are trying to restrict payouts to direct and necessary patient care services. Teaching hospitals are increasing tuition and fees, reducing education budgets and, in many instances, closing education programs. Hospital administrators are examining the institutions to find areas where expenditures can be reduced. Allied health education administrators must justify institutional expenses of sponsoring educational programs. A study determined a financial assessment of the sponsorship and administration costs of the Middlesex Hospital radiography program in Middletown, Connecticut. Program components were evaluated by replicating Shock's cost analysis model for hospital education programs. Degree of competency to perform radiographic examinations was determined by computing scores for the average student in terms of completion of clinical objectives and competency examinations for each semester. Information was obtained by reviewing clinical education records of 14 previous students. Study results revealed that the 14 student radiographers enrolled in the program contributed the services of approximately 11.42 full-time equivalent (FTE) employees. The net total education revenue was $209,002. Student radiographers provided a labor component that significantly reduced the cost of providing radiology services. The radiology program was an asset to the Middlesex Hospital. It was recommended that the Middlesex Hospital continue its efforts to support the program. (NLA)

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A COST ANALYSIS STUDY OF THE RADIOGRAPHY PROGRAM AT MIDDLESEX HOSPITAL USING SHOCK'S ANALYSIS MODEL

Human Resources Development

by

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Middlesex Hospital

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A Practicum Report presented to Nova University in partial fulfillment of the requirements for the degree of Doctor of Education

Nova University

Revised, October, 1991

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A COST ANALYSIS STUDY OF THE RADIOGRAPHY PROGRAM AT MIDDLESEX HOSPITAL USING SHOCK'S ANALYSIS MODEL

by

Weymouth Spence

August, 1991

The federal and state governments are looking for ways to decrease payments for medical education, and other payers are trying to restrict payouts to direct and necessary patient care services. In response, teaching hospitals are increasing tuition and fees, reducing education budgets and in many instances closing education programs. Hospital administrators are examining the institutions with a magnifying glass to find areas where expenditures can be reduced or eliminated. The allied health education administrator must be prepared to justify the institutions expenses of sponsoring educational programs.

The purpose of this study was to determine a dollar value assessment of the cost of sponsorship and administration of a radiography program at Middlesex Hospital in Middletown, Connecticut. An effort was made to evaluate the components of the radiography educational program by replicating Shock's (1990) cost analysis model for hospital education programs. Shock's model was based on

student's clinical competency level at various time frames during the program's enrollment. The degrees of competency to perform radiographic examinations was determined by computing the average student in terms of completion of clinical objectives and competency examinations for each semester. This information was obtained by reviewing clinical education records of fourteen previous students.

The average degree of competency was then translated into an average percentage of student productivity in providing radiology services. The average productive student FTE per day was computed for each semester and a dollar value was determined. The direct and indirect revenues for the radiography program was calculated and subtracted from the total expenses to determine the net total revenue. The student radiographer's contribution and productivity was variable from the first semester to the seventh semester. The results revealed that the fourteen student radiographers enrolled in the program contributed the services of approximately 11.42 FTE. The net total education revenue resulted in the amount of $209,002.00.

Student radiographers provided a labor component which significantly reduces the cost of providing radiology services. The radiography program was an asset to Middlesex Hospital and not a lability. It is recommended that Middlesex Hospital should continue its efforts to support the existence of the radiography program.

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Chapter 1

INTRODUCTION

Background and Significance

Hospitals are operating in an unfavorable political environment. The Federal and State governments, desperate to cut Medicare and Medicaid payments, have forced many hospitals into a financial squeeze play. Hospital administrators are examining the institutions with a magnifying glass to find areas where expenditures can be reduced or eliminated. The services and programs that do not directly produce revenue for the hospital are being closely scrutinized.

The underlying problem was that hospital administrators generally view the sponsorship of radiologic technology education programs as an increasing liability to the hospital. This view, in some instances, leads to the termination of hospital-supported medical education programs.

The purpose of this study was to determine a dollar value assessment of the cost of sponsorship and administration of a 27-month radiography program at Middlesex Hospital in Middletown, Connecticut. Middlesex Hospital, a voluntary, not-for-profit corporation governed by a Board of Directors, is committed to providing select

inpatient and outpatient services to the residents of Middlesex and adjoining communities. The president of Middlesex Hospital recently pointed out that accelerated changes in the delivery of health care continued to alter the role of this hospital over the past two years (Annual Report, 1990). The most significant changes were forced on the hospital by restrictive legislation, competition, life-styles of society and mounting pressures by business, industry and the public against rising health care cost. The analysis study was significant to Middlesex Hospital because the cost of allied health education was computed. Cost minimization is dominating decision-making, This study helped the allied health education administrator understand the institution's expenses in sponsoring educational programs.

An effort was made to evaluate the clinical component of the radiography educational program at Middlesex Hospital by replicating Shock's (1990) cost analysis model for hospital education programs. Shock's model was based on student's clinical competency level at various time frames during the program's enrollment. The degree of competency level was translated into a percentage of entry level productivity, which was used to incorporate the student productive labor data into staff productive labor. This reflected total department productivity. This study was

based upon seven semesters of program enrollment for the 27-month radiography program.

Relationship Between Practicum and Seminar

The specialization seminar on Personnel-Human Resources and Development (P-HRD) presented significant concepts on analysis and evaluation, creating visions of the future, and creating visions into multi-year action plans. This study focused on the concept of analysis and evaluation to justify the existence of the radiography program in terms of productivity and dollar value to Middlesex Hospital.

Chapter 2

REVIEW OF THE LITERATURE

The 1989 report of the National Association for Hospital Development states that hospitals will be in an increasingly weaker financial position because:

1. Hospital costs are growing more rapidly than Medicare and Medicaid payments which account for fifty percent of their income. From 1983 to 1989, federal government payments to hospitals increased only 13.1 percent, while hospital costs increased twenty-eight percent.

2. Hospital labor costs and personnel shortages are increasing rapidly. Applications to medical and nursing schools are declining in number in favor of better paying jobs. Because of these shortages, hospitals are faced with higher labor costs.

The changes taking place in the external environment provided a number of significant trends and opportunities for hospitals and professionals in the health care field. The question now is how will these changes impact allied health education?

A report issued by the Joint Review Committee on Education in Radiologic Technology (1987), mentioned that the Committee continues to be concerned with the number of Radiography programs voluntarily being closed. In the summary report of the Joint Committee on Education in Radiologic Technology (JRCERT) it was stated that a total of forty-eight programs discontinued in 1986, two academic

sponsored and forty-six hospital sponsored. Four new academic sponsored Radiography programs were forwarded to the Committee on Allied Health Education and Accreditation (CAHEA), resulting in a net loss of seven percent of accredited Radiography programs in 1986. The JRCERT report continued by stating that over fifty percent of the programs discontinuing cited the impact of prospective payment system (PPS) and budget restrictions as major reasons for their decision.

In its summer 1987 report the JRCERT also reported that from January 1 to May 31, 1987 thirteen hospital-sponsored and two academic-sponsored programs were discontinued. During the same period three new academic programs were approved. On the issue of the closure of allied Health programs, Sagerman (1987:2) states:

> Changing practice patterns in health care require that institutions respond to increased competition, rising costs and low revenues. These issues filter down to allied health education programs and demand accountability, flexibility and innovation on the part of all of us.

In a study on cost analysis of allied health education programs, Shock (1990) points out that the United States Department of Health and Human Services (HHS) has tackled medical education subsidies, asking for cutbacks in Medicare's direct payments to hospitals for reimbursement of medical education expenses. Because of these cutbacks teaching hospitals are increasing tuition and fees, reducing

education budgets and, in some instances, closing programs. Hospital educators will have a whole new agenda for the 1990s. They will be generating revenue for the hospital, aligning educational goals with hospitals, and quantifying the effect of their work, says Tricia Steam (1990), the president of the American Society for Health Care Education and Training (ASHET) of the American Hospital Association.

Upon completion of a cost analysis study on allied health programs in radiography, nuclear medicine, radiation therapy and medical sonography, Shock (1990:382) stated the following subjective arguments for support of allied health educational programs:

1. Student radiographers provide a labor component of their clinical education requirements, which significantly reduces the cost of providing services. A dollar value can be placed on this component.

2. The environment is enhanced as a result of the education component. Staff technologists maintain required skills as a result of this enhanced environment. In addition, a measure of competition for staff positions by graduates motivates the staff technologist to perform at a higher level.

3. Senior students radiographers often can perform routine tasks under indirect supervision that relieves staff technologists to perform more specialized tasks. This is particularly important when conditions of below optimum staffing exist.

4. Graduate technologists provide an applicant pool from which the hospital may draw. Recruiting and orientation expenses are greatly reduced as a result of this applicant pool.

5. The community benefits through a decrease in the cost of health care by maintaining a technologist employment pool.

6. The community benefits through the provision of education and employment opportunities for members of the community.

7. Education and employment opportunities provide for the preservation of the community population.

In review of the literature authors, such as Shock (1991) and Steam (1991), have presented evidence that a cost analysis study has had positive impact on continued operation of several educational programs. Along with the responsibilities of program administration and curriculum delivery, program directors must be fiscally responsible or accountable for their area of responsibility. The unprepared program director will see budget cuts and possibly total elimination of programs.

A significant means of demonstrating fiscal responsibility was to determine a dollar value assessment of the cost of sponsorship and administration of a radiography program at Middlesex Hospital. Such a study identified the revenue producing capability of the program which often times is unknown to many third party payer reimbursement associated with the program. The literature clearly points out that understanding and recognition of this revenue could be pivotal in any evaluation of the status of an educational program.

Chapter 3

METHODOLOGY AND PROCEDURES

An effort was made to evaluate the components of the radiography educational program at Middlesex Hospital by replicating Shock's (1990) cost analysis model for hospital education programs. Shock's model was based on student's clinical competency level at various time frames during the program's enrollment. Clinical competency is a standardized method of measuring the student's ability to optimally produce a diagnostic radiograph for a specific anatomical body part. Seventy clinical competencies are required for completion of the radiography program. Step one was to determine competency levels. The degree of competency to perform radiographic examinations was determined by computing the average student performance in terms of completion of clinical objectives and competency examinations for each semester. This information was obtained by reviewing clinical education records of previous students for the past three years. The average number of competency examinations completed in specific anatomical categories were calculated per semester by the members of each class. The percent student competency per semester was determined by dividing the average number of competency examinations completed by the total number of competency

examinations required for completion in the program (competency exam completed/total competency required x 100 = productivity). Step two was adjusting for full-time equivalent (FTE) productivity. This was computed by multiplying the full-time equivalent (FTE) student enrollment by the percentage productivity factor. For example, five students were enrolled in the first semester of the second year. Therefore, the second year student in the first semester of the second year was considered to be 2.15 adjusted FTEs (5 FTE students x 43% productivity = 2.15 adjusted FTEs).

The third step of Shock's model was to determine the average productive FTE per day and the net indirect revenue. First year students were assigned to clinical rotations for an average of 1,2 clock hours per day or fifteen percent of the eight hour school day. Second year students were assigned to clinical education rotations six hours per day or seventy-five percent of the eight hour school day. The average productive student FTE per day was computed for each semester by multiplying the adjusted FTE factor by the percent clock hours per day. For example, the second year student in the first semester, the average productive FTE per eight hour day was: 2.15 adjusted FTE x 0.75 = 1.61 average FTE per day.

The dollar value was determined by multiplying the average productive FTE per day by the dollar per hour wage

of an entry level staff technologist, multiplied by eighty hours per two-week pay period, and then multiplied by twenty-six pay periods in one working year (11.25 FTE x $12/hr x 80 hours x 26 pay periods = $280,800). This computation determined the total student FTE dollar value to Middlesex Hospital per year.

The final step in the Shock's cost analysis model was to determine the current expenses. This information was obtained from the radiography program's line item budget. The direct revenues for the radiography program in the form of annual tuition fees and the indirect revenues in the form of calculated FTE dollar values was subtracted from the total expenses to determine the net total revenue.

Definition of Terms

Clinical competency was a standardized method of measuring the student's ability to optimally produce a diagnostic radiography for a specific anatomical body part. Student productivity was the contribution toward hospital services. Indirect revenues was the dollar value of the labor contribution of the students to the services of the radiology department at Middlesex Hospital. Direct revenues were a combination of the tuition of the students and a fee paid by the sponsoring institution, Middlesex Community College, to its clinical affiliate.

Assumptions

It was assumed that Shock's (1991) model to quantify the contribution that student radiographers provided toward radiology department's productivity and patient care was valid. It was also assumed that although this model was developed for cost analysis of a hospital-sponsored radiologic technology education program it can be adapted for analysis of all types of allied health education program.

Limitations

Due to the small sample size, this study cannot be generalized beyond the sample. However, the operational characteristics and structure of the program studied are similar to the operation and structure of other allied health programs. A second limitation that affects this study was that the demographic characteristics that affects program cost, such as salaries, cost of living and geographic location, could be different at other allied health educational programs.

Chapter 4

RESULTS

The results of the various steps in the cost analysis study for the radiography educational program at Middlesex Hospital was the following:

Step 1 Results: Determining competency levels. The total number of competency examinations was seventy. In the first semester of the first year, students did not complete any competencies. During the second and third semesters of the first year, the students completed four and fifteen competency examinations respectively. During the second year of the program in semesters four, five, six and seven, the students completed thirty, forty-six, sixty-four and seventy competencies respectively.

The percent student competency results were zero percent for the first semester, six percent for the second semester, twenty-one percent for the third semester, forty-three percent for the fourth semester, sixty-six percent for the fifth semester, ninety-one percent for the sixth semester, and one hundred percent for the seventh and final semester of the program. Table 1 shows the student percent productivity based on competency examination completion.

Table 1

Student Percent Productivity Based on Competency Examination Completion

Semester	Competency Exams Completed by Student	Total Competency Exams in Program	% Entry Level Productivity (B/Cx100=D)
#1	0	70	0
#2	4	70	6
#3	15	70	21
#4	30	70	43
#5	46	70	66
#6	64	70	91
#7	70	70	100

Step 2 Results: Adjusting for FTE productivity. The full-time equivalent (FTE) student enrollment was adjusted by multiplying it by the percentage productivity factor. The results of the percent productivity and the adjusted FTE per productivity are presented in Table 2.

Table 2

Percent Productivity and Adjusted FTE Per Productivity

Education Program	# Student FTE	% Productive	Adjusted FTE Per Productivity
First Years			
1st Semester	10	0	0
2nd Semester	10	6	0.60
3rd Semester	8	21	1.68
First Year Averages	**9**	**9**	**0.76**
Second Years			
1st Semester	5	43	2.15
2nd Semester	5	66	3.30
3rd Semester	5	91	4.55
4th Semester	5	100	5.00
Second Year Averages	**5**	**75**	**3.75**
Total Averages	**14**	**84**	**4.51**

Step 3 Results: Average productive FTE per day and net indirect revenue. First year students were assigned to clinical education rotations for an average of 1.2 clock hours per day or fifteen percent of the eight hour school day. Second year radiography students were assigned to

clinical education rotations six hours per day or seventy-five percent of the eight hour school day. Table 3 shows the average productive FTE per day for both first and second year radiography students. Table 3 also shows the net indirect revenues.

Table 3

Average Productive FTE Per Day
and Net Indirect Revenues

Education Program	Adjusted FTE Per Productive	Average Productive FTE Per Day	Net Direct Revenues
First Years			
1st Semester	0	0	
2nd Semester	0.60	0.09	
3rd Semester	1.68	0.25	
Averages	**0.76**	**0.17**	
$Value of First Years			**$4,243.00**
Second Years			
1st Semester	2.15	1.61	
2nd Semester	3.30	2.48	
3rd Semester	4.55	3.41	
4th Semester	5.00	3.75	
Averages	**3.75**	**11.25**	
$Value of Second Years			**$280,800.00**
Total Annual $Value FTE/Year			**$285,043.00**

Step 4 Results: Net revenue generated. The final step in the cost analysis study was to determine current expenses and personnel expenses for administration of the radiography program. The direct revenues for the program were in the form of annual tuition fees of $3,736.00 per year for all students and an annual Middlesex Community College payment to Middlesex Hospital in the amount of $14,803.00. This resulted in a total direct revenue of $18,539.00. The indirect revenues were in the form of student FTE dollar values of $285,043.00

Expenses included current expenses of $22,955.00 and personnel expenses of $71,625.00. The net total education revenue resulted in the following:

Total Indirect Revenues	$285,043.00
Total Direct Revenues	$ 18,539.00
Less Expenses	(94,580.00)
Net Total Revenue	$209,002.00

Table 4 shows the cost analysis budget format of the net total revenue.

Table 4

Cost Analysis Budget Format

Budget Items	Expenses	Indirect Revenues	Direct Revenues	Net Total
Students FTE $Value		285,043		
Tuition (6/90-5/91)			3,736	
College Payment			14,803	
Salaries & Wages	71,625			
Current Expenses	22,955			
Total Revenues		285,043	18,539	303,582
Total Expenses	94,580			94,580
Net Total Revenue				209,002

Chapter 5

DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Discussion

An analysis of the results of this study reveals that there was a mechanism for dollar analysis of the contributions of the clinical component of an allied health education program towards services provided by a sponsoring health care institution. The subjective arguments presented in the review of the literature, such as labor, enhanced environment, and applicant pool, can be supported and reinforced by the results of this analysis. The results quantify that student radiographers contributed toward the radiology department's productivity and patient care during student clinical education.

The student radiographer's contribution and productivity was increased from the first semester to the seventh semester. This was based upon the student's exposure to the programs curriculum. A radiography student in the first semester was considered zero percent productive in the performance of radiology services during the first semester of the program enrollment when compared to a student in the seventh semester of the program enrollment. The student in the seventh semester was considered one hundred percent productive, based upon completion of

clinical education objectives and student competency examinations.

The student in the second semester of the radiography program was competent to transport the patient from the patient reception area to the examination room, and assisted the staff technologist by preparing the room for examinations. In the latter stages of the semester, the student completed chest, abdomen and extremities competency examinations. The student in the seventh semester of program enrollment was ready to enter the work force and was capable of one hundred percent productivity in terms of entry level staff technologist performance requirements. It was apparent that the average student productivity contribution toward hospital services increases from semester to semester as the student progresses through the clinical rotation.

The results of the total annual dollar value calculations revealed that for each semester and for each class in the radiography program, the total student full-time equivalent (FTE) dollar value to the hospital per year was $4,243 for the first year and $280,800 for the second year, totaling $285,043. The results revealed that the fourteen student radiographers enrolled in the program contributed the services of approximately 11.42 FTE entry-level staff technologist annually. This was a significant

labor contribution, especially in view of the current allied health manpower shortage.

Conclusion

Student radiographers provided a labor component, as a function of clinical education requirements, which significantly reduces the cost of providing services. A dollar value can be placed on this component. The student performing under indirect supervision in the second year of the program was more productive than the student performing under direct supervision in the first year, relative to contribution in providing services to the patient. Students in the second year of the program often performed more routine tasks under indirect supervision thus relieving staff technologist to perform more specialized tasks. This was particularly important when below optimum staffing conditions existed.

The radiography program was an asset to Middlesex Hospital and not a liability. The fourteen student radiographers made a major contribution to the labor force of radiology services. The clinical education component of a radiography program can make a difference in the operation of a radiology department. Allied health educators must justify educational programs in terms of dollars. The cost analysis study demonstrated that the radiography program was

an asset to the hospital, the community and the development of its human resources.

Implications

This study provided a mechanism for dollar value analysis of the contribution of the clinical component of an allied health education program towards services provided by a sponsoring institution. Hospital-based education programs, which are being closed left and right because they are supposedly money-losers, are in fact profit centers or, at the very least, self-supporting activities with significant financial benefits.

Directors and administrators of all types of health educational programs must now financially justify the continued monetary support of allied health programs. Changes in the method of payment from a retrospective-cost-based system to a flat-rate prospective system based on Diagnostic Related Groups (DRG), have ushered health care into an era of budget scrutiny and cost containment. Allied educators must justify programs' existence in terms of dollars. The health care educator will have to function in a dual role. The role of educator and the role of accountant/administrator. The unprepared program director will see budget cuts and possibly total elimination of programs.

Recommendations

Hospital administrators talk in terms of dollars. Therefore, it was recommended that allied health educators must justify programs' existence in terms of dollars. Middlesex should continue its effort to support the existence of the radiography program.

This cost analysis study of the radiography program at Middlesex Hospital has been shared with the radiology administrator and the vice-president of Middlesex Hospital with the responsibility of radiology management. There was a consensus that the radiography program is an asset to the hospital. The stimulating clinical environment fostered by the radiography program were recognized as important contributions to quality patient care. The administration of Middlesex Hospital have further demonstrated its recognition to its educational programs by recently including the following statement in its new mission statement. It states: To recognize and support the important contribution our physicians, nursing and technical education programs make to the quality of patient care (Middlesex Hospital, 1991)

On the basis of this study, cost analysis studies should be done on a continual basis with varying allied health education programs to further substantiate the results.

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